3.4.4. Mission Utility and Integration

3.4.4.1. Purpose

The purpose of this test is to assess the utility of the OMEGA system as a position fixing navigation aid and the integration of the OMEGA with the other aircraft avionics, controls and displays.

3.4.4.2. General

As a position fixing system with a long integration time, the primary purpose of the OMEGA is to provide position updates to the DR system (the INS is the sample system here); however, a limited display of OMEGA information integrated into the other aircraft displays is desired. Since OMEGA updates of the INS are expected, the process should be easily performed in a tactical environment. The accuracy of the OMEGA must be consistent with navigation requirements during long range ingress to the target area for an attack aircraft and for station keeping and return to base for a fighter. For the purposes of this sample test procedure, the test aircraft will be an attack aircraft equipped with an air-to-ground radar and an INS that has an OMEGA update mode.

3.4.4.3. Instrumentation

Data cards are required for this test. A voice recorder is highly recommended.

3.4.4.4. Data Required

Record qualitative comments concerning the utility of the OMEGA position fix as an update to the INS. Record comments concerning the accuracy of the OMEGA update as an aid for navigating to and determining the position of the target accurately enough to enable a radar acquisition of the target. Record comments concerning the utility and integration of the OMEGA navigation data displays and the controls necessary for performing an OMEGA update during a mission relatable ingress to the target area. Record as notes a description of the weather conditions.

3.4.4.5. Procedure

Select a mission relatable target in the test area that allows for a 35 to 40 nm ingress to the target location. Select several waypoints inbound to the target. While navigating from the home airfield to the initial waypoint, perform OMEGA/INS updates and assess the utility of the update controls and OMEGA displays for ferry navigation. Descend to a low altitude of approximately 500 feet AGL if safety permits and set an airspeed near the sea level limit of the test aircraft. Head inbound to the target and select a radar mapping mode with at least a 40 nm scale and a wide scan pattern useful for radar mapping. Following the updated INS and radar cues, fly inbound to the target, passing over the waypoints along the route. Once the target is acquired on radar, turn outbound and fly the reverse route to the initial point. Perform another OMEGA update during the reverse route. Use a voice recorder or write down comments after each run. Care should be taken not to become distracted with recording data to allow the best overall qualitative evaluation.

3.4.4.6. Data Analysis and Presentation

Relate the utility of the OMEGA/INS update controls and accuracy to the requirement for suitable position information for finding the target on radar and for long range navigation ferry flights. The updates should be quickly and easily performed in a high workload IMC navigation or attack ingress environment.

3.4.4.7. Data Cards

A sample data card is provided as card 47.

CARD NUMBER ___ TIME ___ PRIORITY L/M/H

OMEGA MISSION UTILITY AND INTEGRATION

[AFTER TAKEOFF, CLIMB TO _____ FEET MSL AND SET ___KIAS, PERFORM AN OMEGA UPDATE AND USE OMEGA INFORMATION TO NAVIGATE TO THE INITIAL POINT, ASSESSING THE UTILITY OF THE OMEGA'S ACCURACY AND DISPLAYS FOR IMC NAVIGATION. DESCEND TO ___ FEET AGL AND SET ___KIAS AT THE INITIAL WAYPOINT. SET A 40 NM RADAR SCALE AND A _____° SCAN ANGLE LIMIT. SEARCH FOR THE TARGET ON RADAR WHILE NAVIGATING TO THE WAYPOINTS. WHEN THE RADAR TARGET IS ACQUIRED, RETURN TO THE INITIAL POINT USING THE RECIPROCAL FLIGHT PATH.]

INITIAL WAYPOINT 1 POSITION __________ __________

WAYPOINT 2 POSITION __________ __________

WAYPOINT 3 POSITION __________ __________

NOTES:

Card 47: OMEGA Mission Utility and Integration Data Card

3.4.5. Introduction to Advanced OMEGA Navigation System Test Techniques

As mentioned in Chapter 1, only the most rudimentary form of the OMEGA navigation system test techniques are presented in this book. Chapter 1 details the reasons for this format; however, in many applications, more rigor, accuracy and documentation of results are required. Table V outlines additional instrumentation and assets which are typically applied in these more advanced tests. The purpose of this table is merely to emphasize the existence of these advanced techniques. Further, this list is not exhaustive. Many innovative uses of assets and instrumentation exist. It is hoped that the examples provided leave the reader with a taste of how the test can be made more rigorous through the judicious use of instrumentation. In application; the user must refer to the more advanced documents referenced in Chapter 1 or solicit help from more experienced testers.

Table V: Additional Assets or Instrumentation for use in Advanced OMEGA Navigation System Tests

Test	Additional Asset or Instrumentation	Purpose/Benefit
Initialization.	Digital recording of OMEGA derived position, site selections, and operator actions. Precisely surveyed initialization location. Validated OMEGA receiver located close to the test aircraft. Precise documentation of weather and propagation effects.	The entire initialization is recorded, allowing isolation of the causes of a slow or failed initialization. The test OMEGA initialization is compared to a second OMEGA with known characteristics. When both have initialization problems, correlation is made with the recorded weather and known propagation anomalies. The initialization is correlated to operator selections. The first position is compared to the known alignment location.
Dynamic Position Accuracy.	Digital recording of time stamped space positioning data, OMEGA derived position and site selections, and operator actions. Video recording of the time stamped display. Precise documentation of weather and propagation effects.	The profile is flown without the necessity of surveyed point flyovers. Space positioning data and aircraft dynamics are continuously recorded and later compared to OMEGA derived values. If derived from a range, the profile is often constrained geographically. Recently, Global Positioning System (GPS) data can be used with sufficient accuracy to avoid constricting the profile. The time stamped display video is compared to the OMEGA data to check for inconsistencies caused by the manipulation of the OMEGA data and then its display. If problems are noted, the errors are first compared to known weather and propagation problems. The OMEGA selection of ground sites is compared to the expected site use (based upon the time stamped aircraft location) for inconsistencies.

Table V: Additional Assets or Instrumentation for use in Advanced OMEGA Navigation System Tests

Test	Additional Asset or Instrumentation	Purpose/Benefit
Lane Ambiguity Resolution.	Digital recording of time stamped space positioning data, OMEGA derived position and site selections, and operator actions. Video recording of the time stamped display. Precise documentation of weather and propagation effects.	The precise aircraft location at the time the erroneous position error is entered is compared directly to determine the position error at each initialization. Elapsed time is derived at the time the initialization is complete and the position is compared to the known aircraft location. The displayed positions and operator feedback are compared to the time stamped OMEGA parameters. When unexpected problems are noted in lane ambiguity resolution, the errors are first compared to known weather and propagation problems.
Mission Utility and Integration.	Digital recording of time stamped space positioning data, OMEGA derived position and operator actions. Video recording of the time stamped display. Time stamped, digital recording of all navigation data passed to other aircraft systems.	This test requires the largest amount of data to completely document the results. It is during this test that most of the unexpected problems are found. In anticipation of having to document these deficiencies, maximum instrumentation and range support are sometimes brought to bear in case unforseen data are required in post-flight analysis.